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TRADE IMPLICATIONS OF SOYBEAN POLICIES[1]

by

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Abstract

We analyze domestic and border policies for soybeans in Brazil, Argentina, and the EU with an econometric trade model which has five regions: the US, Brazil, Argentina, the European Union, and a Rest-of-the-World; and three commodities: soybeans, soymeal, and soyoil. Prices for domestic agents are linked to world prices via policy equations that reflect wedges due to producer subsidies in the EU, and export taxes for Brazil and Argentina. We found that the US benefits from existing (i.e., as of 1990) policies in Brazil and Argentina. The European Union, however, loses from existing policies in Brazil and Argentina. The US and Argentina lose from producer subsidies in the European Union. Brazil, however, gains from producer subsidies in the European Union.

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I. INTRODUCTION

Soybeans, soymeal and soyoil are one of the four most important categories of agricultural commodities in world trade based on value of trade. While consumption of soybeans and soybean products is widely dispersed around the world, production of soybeans is concentrated in the United States, Brazil, China, and Argentina. The US is the largest soybean producer with 48 percent of the world production. Other major soybean producers include Brazil (18 percent), Argentina (10 percent), and China (10 percent). The European Union (EU) dominates the soybeans and soymeal import market, accounting for about half of global imports. Exports of soybeans and soymeal are dominated by the US, Brazil, and Argentina. The EU is the major exporter of soyoil. The EU and Japan account for over 65 percent of global imports of soybeans and soybean products. Soybean oil tends to be imported more widely and by less developed countries.

The structure of global agricultural trade has changed rapidly during the last two decades, and the US soybean industry depends significantly on a growing foreign market. Due to the rapid growth in exports in soybeans and soybean products by Brazil and Argentina, the US dominance in the soybeans market has eroded. Brazil ranked second in soybean exports, accounting for 18.6 percent of world exports in 1993. Brazil is first in exports of soymeal, with 33 percent of the world market, and approximately 70 percent of its soymeal production was exported in 1993. Brazil ranks behind Argentina and the US in the world soyoil exports.

Meal and oil are the major soybean products and they are produced jointly by the crushing industry. The production and consumption level as well as the price of soybeans

are determined by the supply and demand situation in the oil and meal markets. Thus, soybeans are affected by developments in the international feed and livestock markets and the edible fats and oils markets. Most studies of the soybean and soybean products sectors have concentrated on trade for a single commodity and a single region. Knipscheer and Hill (1982) estimated country specific demands for soymeal for EU member countries. Knipscheer and Hill related soymeal demand to animal production in the EU, which during the years used in the study, was subject to price support. They found that US soymeal exports benefited from the EU's price support for livestock.

A few studies have estimated export supplies and import demands for several regions. Huyser (1983) estimated a global soybean and soymeal model with 10 trading regions. She found that if the EU imposed import tariffs on soymeal and soybeans, global trade in soybeans and soymeal would decline, with the US losing the most among exporters.

Von Wiztke and Houck (1987) analyzed the impacts of a consumption tax on soyoil in the EU, and import restrictions on soybeans and soymeal in the EU. Von Wiztke and Houck used a model with two regions (i.e., the EU and a Rest-of-the-World), and three commodities: soybeans, soymeal and soyoil. They found that a consumption tax on soyoil or an import tariff on soymeal would not have any significant effect on EU imports of soybeans, soymeal, and soyoil.

Williams (1981) examined the effect of government intervention in domestic markets for six major oilseeds (i.e., soybeans, rapeseed, cottonseed, peanuts, copra, and palm fruits) and their products. He used a trade model with seven regions (i.e., the US, Canada, Brazil, the European Community-9, Japan, Asia-Oceania, and Africa). Williams found that the

major determinant of demands for most groups of oils and meals in all regions were population and per capita income. He also found that government intervention affected the behavior of domestic markets for oilseeds and their products.

This paper analyzes domestic and border policies for soybeans in Brazil, Argentina, and the EU. We use an econometric trade model with five regions: the US, Brazil, Argentina, the European Union (EU), and a Rest-of-the-World (ROW); and three commodities: soybeans, soymeal, and soyoil (Christina-Tsigas, 1994). For each region and each commodity, the relevant supply and demand functions have been estimated with Ordinary Least Squares, using annual data. The world price for each commodity (i.e., soybeans, soymeal, and soyoil) is determined by market clearing in the world market, i.e., equilibrium is achieved when the sum of excess supplies of exporting countries is equal to the sum of excess demands of importing regions. Prices for domestic agents are linked to world prices via policy equations that reflect wedges due to producer subsidies in the EU, and export taxes for Brazil and Argentina. Other relevant policies were also taken into account when estimating supply and demand functions (e.g., grain subsidies in the US, and export taxes on wheat, corn, sunflowers in Brazil and Argentina).

II. SIMULATION RESULTS

In this section we analyze the effects of three policies. First, we simulate the elimination of oilseed producer subsidies in the EU. Second, we simulate the elimination of soybean export taxes in Brazil. Finally, we simulate the elimination of soybean export taxes in Argentina. We concentrate on results for the US, Brazil, Argentina, and the EU. In all cases, we compare simulation results to the base year, which is 1990.

1. Elimination of Soybean Producer Subsidies in EU

The Blair House Agreement (November, 1992) between the US and EU put a cap on total EU acreage planted in oilseeds. The cap was implemented through an EU commitment to set aside a minimum percent of oilseed base area. Beginning with the 1992/93 harvested crop, the EU support regime replaced its producer price supports with direct payments to producers based on their acreage planted to oilseeds. In addition, EU oilseed producers receive the market price, which reflects world supply and demand conditions for oilseeds. Commercial producers must set aside a percentage of their land to receive a direct payment. Small producers are not required to set aside acreage, but they receive the grains payment, which is lower than the oilseed payment. In July 1994, the first year of the US - EU oilseed implementation agreement, the EU re-instituted a maximum guaranteed area (MGA), which limits the oilseed acreage on which payment would be made without a penalty. The base area for oilseeds (i.e., rapeseed, sunflower-seed, and soybeans) is set at 5.128 million hectares for the EU beginning in 1995/96. The MGA can be no greater than the base area minus the higher of either 10 percent or the announced set-aside rate (Castaneda and Normile, 1994).

This section evaluates the elimination of a 77 percent subsidy for soybean producers in the EU. The elimination of direct subsidies reduces the soybean producer price by 40.8 percent in the EU (table 1, part A). Without further market price adjustments, the lower returns causes EU soybean production to decline by 63 percent through adjustments in both acreage and yield. This corresponds to a leftward shift in the EU supply curve of soybeans of 1.4 million metric tons, which is a significant production adjustment for the EU. From

a global perspective, however, the elimination of EU oilseed producer subsidies does not have a large effect on the global market. The 1.4 million metric tons corresponds to 1 percent of world production, or 11 percent of soybean imports by the EU. Furthermore, the 1.4 million metric tons adjustment probably overstates the EU production adjustment. The MGA imposes constraints on the total acreage planted to soybeans in the EU, and the 1.4 million metric tons overstates the actual shift in EU supply curve to the extent that this land constraint is binding. Therefore, our results should be viewed as upper bounds on the magnitude of the impacts that could be expected if the EU were to eliminate subsidies for soybeans.

The reduction in the EU soybean supply causes excess demand in the world market to increase. With higher demand, world soybean prices increase by 4.6 percent (table 1, part A), which increases soybean profitability in non-EU regions. Thus, once market prices reach a new equilibrium, EU soybean production decreases by 60 percent (table 1, part A) (as opposed to the initial impact of 63 percent). Soybean producers in the US, Brazil, and Argentina also respond to the higher price with a modest increase in production.

The increase in world soybean price causes profit margins for the crushing industry to decline in all regions because the cost of soybeans (i.e., the input) has increased. Consequently, the demand for soybeans for crush declines in all regions. The EU expands its demand for soybean imports by 8.7 percent (table 1, part A), to fill the shortage caused by lower domestic production, even though its demand for crush declines. The US, Brazil, and Argentina increase their exports to the EU, but these countries do not share equally in the expansion in world demand (see results for net exports in table 1). In 1990 the US

accounted for 52 percent of world soybean exports, and so the US obtains the largest share of the expanded world export market. This primarily reflects the higher capacity in the US for expansion of soybean production.

The production of soymeal and soyoil falls by the same percentage as the quantity crushed in all four countries. This decline in production of soybean products leads to an increase in their world prices. The soymeal price increases by 4.4 percent, and the soyoil price increases by 1.2 percent. Consequently, the domestic demand for soymeal and soyoil declines in all four countries. The EU expands its demand for imports of soymeal to fill the shortage caused by lower domestic production, but to a lesser degree than the demand for imports of soybeans.

Exports for soymeal respond differently than exports for soybeans. The EU is important Western Hemisphere countries as an export market for soymeal. As the world soymeal price increases, the EU reduces its imports of soymeal. The reduction in the import demand by the EU causes a reduction in exports from Brazil and Argentina to the EU. Although, exports of meal decline for all three of the Western Hemisphere countries, the US sustains a proportionately larger loss in this market (table 1). This could be explained by the incentives offered by Brazil and Argentina to promote exports of processed soybean products over exports of raw soybeans.

The welfare impacts of this simulation are summarized in the second part of table 1. Soybean producers in the EU lose about $US 235 million, but producers in all other regions gain due to a higher world price for soybeans. The crushing sector as well as the demanders of soymeal and soyoil lose in all regions. The EU realizes tax savings of about $US 230

million because it eliminates soybean subsidies. The total welfare impact is negative for the EU, and Brazil. The US and Argentina gain $US 156 and 121 million, respectively.

2. Soybean Export Tax Elimination in Brazil

We next evaluate the elimination of a 5 percent export tax on soybeans in Brazil. The elimination of soybean taxes in Brazil would increase domestic soybean production by 1.2 percent, through adjustments in both acreage and yield (table 2, part A). This corresponds to a rightward shift in the Brazilian supply curve of soybeans by 200 thousand metric tons from the initial level of 15.8 million metric tons. Brazil's exports increase by 20 percent. The elimination of Brazil's soybean tax does not have a large effect on the global market, since the 200 thousand metric tons correspond to 1.3 percent of world production.

With a 1.2 percent increase in Brazil's soybean supply, the world soybean price decreases by 0.6 percent (table 2, part A). In Brazil, however, the price of soybeans increases by 4.8 percent (table 2, part A). This change in the price of soybeans causes the profitability of soybean crushing in Brazil to decline by 4.9 percent (table 2, part A). The decrease in world price of soybeans causes the crush profit margins to increase for all other countries. Specifically, the profit margins increase by 0.3 percent in the US and EU, and 0.4 percent in Argentina (table 2, part A). As a result, the quantity of soybeans crushed increases in the US, Argentina, and EU, by 0.2, 0.1, and 0.6 percent respectively, and it decreases by 0.5 percent in Brazil.

The world prices for soymeal and soyoil decrease by 0.5 percent and by 0.1 percent, respectively. The magnitude of the percent change in the production of soymeal and soyoil is the same with that of the demand for crush. Demand for crush declines in Brazil, but it

increases in the other countries (table 2). The domestic demand for soymeal and soyoil increases insignificantly in Brazil (note that table 2 shows a 0.0 percent change). In the other countries, too, there are small increases in the domestic demand for soymeal and soyoil. Brazil's exports of soymeal and soyoil decline, whereas they increase for the other countries.

The welfare impacts of this simulation are summarized in the second part of table 2. Soybean producers in Brazil gain about $US 168 million because they now receive a higher price for soybeans (i.e., the world price). But producers in all other regions lose due to a lower world price for soybeans. The crushing sector as well as the demanders of soymeal and soyoil gain in all regions. However, the crushing sector in Brazil loses in producer surplus because they were benefiting from the export tax. The total welfare impact is positive for Brazil and the EU. The US and Argentina lose $US 25 and 15 million, respectively.

3. Soybean Export Tax Elimination in Argentina

We next evaluate the elimination of a 36 percent export tax on soybeans by Argentina. The elimination of soybean export taxes causes Argentinean soybean production to increase by 21.4 percent (table 3, part A), through adjustments in both acreage and yield. This corresponds to a rightward shift in the Argentinean supply curve of 2.4 million metric tons from the initial level of 11.5 million metric tons of soybeans. Argentina's exports increase by 97 percent and the world soybean price decreases by 9.6 percent (table 3).

The price for soybeans increases by 41.5 percent in Argentina. Thus, the profitability of soybeans crushed in Argentina declines by 33.0 percent (table 3). The decrease in world

price of soybeans causes the crush profit margins to increase for all other countries. Specifically, the profit margins increase by 4.9 percent for the US, 5.0 for EU, and 5.1 percent for Brazil. As a result, the quantity of soybeans crushed increases in the US by 3.0 percent, in EU by 9.5 percent, and in Brazil by 0.5 percent, but it decreases in Argentina by 14.8 percent (table 3).

Argentina's soybean exports increase by 96.9 percent, whereas soybean exports decrease by 9.6 percent in the US, by 34.0 percent in Brazil, and by 12.6 percent in the EU.

The world prices of soymeal and soyoil decrease by 7.1 percent and by 2.0 percent, respectively. The magnitude of the percent change in the production of soymeal and soyoil is the same with that of the demand for crush. Argentina's exports of soymeal and soyoil decrease by 15 and 16 percent, respectively. For the other countries, exports increase. The domestic demand for soymeal increases by 9.2 percent in Argentina, by 1.2 percent in the US, by 3.0 percent in the EU, and by 0.3 percent in Brazil. The domestic demand for soyoil increases by 4.4 percent in Argentina, by 0.8 percent in the US, by 0.6 percent in the EU, and by 0.3 percent in Brazil.

The welfare impacts of this simulation are summarized in the second part of table 3. Soybean producers in Argentina gain about $US 777 million because they now receive a higher price for soybeans (i.e., the world price). But producers in all other regions lose due to a lower world price for soybeans. The crushing sector as well as the demanders of soymeal and soyoil gain in all regions, except the crushing sector in Argentina. The total welfare impact is positive for Argentina and the EU. The US and Brazil lose $US 282 and 145 million, respectively.

III. SUMMARY AND CONCLUSIONS

This paper analyzed domestic and border policies for soybeans in Brazil, Argentina, and the EU. We used an econometric trade model with five regions: the US, Brazil, Argentina, the European Union, and a Rest-of-the-World; and three commodities: soybeans, soymeal, and soyoil.

The elimination of subsidies for soybean producers in the EU causes EU soybean production to decline substantially. Soybean producers in the US, Brazil, and Argentina increase production. The increase in world soybean price causes profit margins for the crushing industry to decline in all regions. Thus, the production of soymeal and soyoil falls in all four countries. This decline in production of soybean products leads to an increase in their world prices. As the world soymeal price increases, the EU reduces its imports of soymeal. Soybean producers in the EU lose in producer surplus, but producers in all other regions gain. The crushing sector, and demanders of soymeal and soyoil lose in all regions. The EU realizes tax savings because it eliminates soybean subsidies. The total welfare impact is negative for the EU, and Brazil. The US and Argentina gain.

The elimination of export taxes on soybeans in Brazil causes an increase in domestic production and exports of soybeans. Thus the world soybean price decreases, which makes soybean crushing more profitable, with the exception of Brazil. As a result of increased soyoil and soymeal supplies, the world prices for soymeal and soyoil decline. However, Brazil's exports of soymeal and soyoil decline because its crushers have reduced their operations. Soybean producers in Brazil gain in producer surplus, but producers in all other regions lose due to a lower world price for soybeans. The crushing sector and demanders

of soymeal and soyoil gain in all regions. However, the crushing sector in Brazil loses in producer surplus. The total welfare impact is positive for Brazil and the EU. The US and Argentina lose.

The elimination of export taxes on soybeans by Argentina causes Argentinean soybean production to increase. The price for soybeans increases in Argentina and the profitability of soybeans crushed declines. The decrease in world price of soybeans causes the crush profit margins to increase for all other countries. As a result, the quantity of soybeans crushed increases in the US, EU, and in Brazil, but it decreases in Argentina. Argentina's soybean exports increase. The world prices of soymeal and soyoil decrease. Soybean producers gain in producer surplus in Argentina, but producers in all other regions lose. The crushing sector and demanders of soymeal and soyoil gain in all regions, except the crushing sector in Argentina. The total welfare impact is positive for Argentina and the EU. The US and Brazil lose.

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Table 1. IMPACTS ASSOCIATED WITH THE ELIMINATION OF EUROPEAN UNION'S OILSEED SUBSIDES

	US	BRAZIL	ARGENT.	EU
A. Prices and Quantities in Percentage Change				
SOYBEANS				
Production	0.5	1.1	2.3	-60.0
Net exports	3.4	15.4	8.3	-8.7
Producer price	4.6	4.6	4.6	-40.8
PROCESSING				
Quantity crushed	-0.9	-0.2	-0.6	-2.7
Crush profit margin	-1.5	-1.5	-1.3	-1.4
SOYMEAL				
Production	-0.9	-0.2	-0.6	-2.7
Demand	-0.7	-0.2	-5.7	-1.9
Net exports	-1.4	-0.1	-0.5	-1.0
Producer price	4.4	4.4	4.4	4.4
SOYOIL				
Production	-0.9	-0.2	-0.6	-2.7
Demand	-0.5	-0.1	-2.6	-0.4
Net exports	-7.9	-0.3	-0.5	-9.8
Producer price	1.2	1.2	1.2	1.2
B. Welfare Impacts in $ US million				
PRODUCERS	563.32	161.00	79.86	-235.27
CRUSHERS	-101.32	-163.81	-4.12	-39.33
STOCKS				
Soybeans	-94.46	0.00	0.00	0.00
Soymeal	-2.47	0.00	0.00	0.00
Soyoil	-4.98	0.00	0.00	0.00
CONSUMERS				
Soymeal Demand	-169.46	-21.76	-0.99	-162.13
Soyoil Demand	-34.38	-13.35	-0.35	-8.61
TAX	0.00	9.91	47.24	230.85
TOTAL	156.25	-28.01	121.64	-214.49

Table 2. IMPACTS ASSOCIATED WITH THE ELIMINATION OF BRAZILIAN SOYBEAN TAXES

	US	BRAZIL	ARGENT.	EU
A. Prices and Quantities in Percentage Change				
SOYBEANS				
Production	-0.1	1.2	-0.3	-1.1
Net exports	-0.7	20.0	-1.3	-0.8
Producer price	-0.6	4.8	-0.6	-0.6
PROCESSING				
Quantity Crushed	0.2	-0.5	0.1	0.6
Crush profit margin	0.3	-4.9	0.4	0.3
SOYMEAL				
Production	0.2	-0.5	0.1	0.6
Demand	0.1	0.0	0.7	0.2
Net exports	0.7	-0.7	0.1	0.2
Producer price	-0.5	-0.5	-0.5	-0.5
SOYOIL				
Production	0.2	-0.5	0.1	0.6
Demand	0.1	0.0	0.3	0.0
Net exports	2.7	-5.0	0.1	2.4
Producer price	-0.1	-0.1	-0.1	-0.1
B. Welfare Impacts in $ US million				
PRODUCERS	-83.56	168.70	-11.60	-6.27
CRUSHERS	19.20	-145.76	3.12	8.26
STOCKS				
Soybeans	14.09	0.00	0.00	0.00
Soymeal	0.30	0.00	0.00	0.00
Soyoil	0.56	0.00	0.00	0.00
CONSUMERS				
Soymeal Demand	20.42	2.64	0.12	19.66
Soyoil Demand	3.84	1.49	0.04	0.97
TAX	0.00	-17.63	-6.69	7.21
TOTAL	-25.15	9.44	-15.01	29.83

Table 3. IMPACTS ASSOCIATED WITH THE ELIMINATION OF ARGENTINEAN SOYBEAN TAXES

	US	BRAZIL	ARGENT.	EU
A. Prices and Quantities in Percentage Change				
SOYBEANS				
Production	-1.1	-2.3	21.4	-15.3
Net exports	-9.6	-34.0	96.9	-12.6
Producer price	-9.6	-9.6	41.5	-9.6
PROCESSING				
Quantity crushed	3.0	0.5	-14.8	9.5
Crush profit margin	4.9	5.1	-33.0	5.0
SOYMEAL				
Production	3.0	0.5	-14.8	9.5
Demand	1.2	0.3	9.2	3.0
Net exports	10.8	0.6	-15.1	-3.4
Producer price	-7.1	-7.1	-7.1	-7.1
SOYOIL				
Production	3.0	0.5	-14.8	9.5
Demand	0.8	0.3	4.4	0.6
Net exports	41.3	3.0	-15.9	36.3
Producer price	-2.0	-2.0	-2.0	-2.0
B. Welfare Impacts in $ U.S. million				
PRODUCERS	-1154.19	-326.95	777.20	-80.84
CRUSHERS	325.05	127.29	-505.90	145.40
STOCKS				
Soybeans	196.36	0.00	0.00	0.00
Soymeal	4.03	0.00	0.00	0.00
Soyoil	10.55	0.00	0.00	0.00
CONSUMERS				
Soymeal Demand	277.61	35.78	1.74	162.13
Soyoil Demand	57.84	22.46	0.61	8.62
TAX	0.00	-4.16	-233.60	93.25
TOTAL	-282.75	-145.58	40.05	328.56

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